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ORIGINAL STUDY

Cross-Cultural Comparison of Nomophobia, Netlessphobia and Anxiety among Nursing Students in Iran and Türkiye: *A mediation analysis*

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Advances in Knowledge

- This study identified significant cross-cultural differences in netlessphobia and anxiety levels between Turkish and Iranian nursing students, with Turkish students exhibiting higher netlessphobia and Iranian students reporting greater anxiety.
- Netlessphobia and nomophobia were strong predictors of anxiety, explaining over 30% of variance in anxiety levels in both populations.
- Findings revealed that 77% of the relationship between constant mobile phone use and anxiety was mediated by netlessphobia and nomophobia, highlighting their indirect yet substantial impact on mental health.
- There were no significant gender differences in nomophobia, netlessphobia or anxiety, contrasting with previous studies and suggesting cultural or academic influences on digital dependency.

Application to Patient Care

- This study provides evidence for integrating digital wellness programmes into nursing education to address netlessphobia and nomophobia, potentially reducing anxiety and improving mental health outcomes.
- There is a need for culturally tailored interventions, as Turkish and Iranian students' exhibited distinct patterns of digital dependency and anxiety.
- Mental health resources, such as stress management workshops and peer support programmes, to mitigate the psychological impact of technology overuse should be supported.
- Healthcare educators should be encouraged to promote balanced technology use, including scheduled screen breaks and tech-free zones, to foster healthier digital habits among students.

ABSTRACT

Objectives: In the digital era, excessive reliance on smartphones and internet access has led to emerging psychological concerns, including nomophobia (fear of being without a mobile phone) and netlessphobia (fear of being without internet), which are increasingly linked to anxiety among students. This study aimed to compare the prevalence and psychological impact of these phobias among nursing students in Iran and Türkiye. ***Methods:*** This cross-sectional study was included nursing students; participants completed validated questionnaires assessing nomophobia, netlessphobia and anxiety. Data were collected from June to July 2024 via paper-based and electronic surveys. Statistical analyses included independent t-tests, multiple regression and mediation modeling. ***Results:*** A total of 697 nursing students were included (mean age = 21.94 years, 96.4% were single) from in Iran (n = 381) and Türkiye (n = 316). No significant

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gender differences were found in terms of nomophobia, netlessphobia or anxiety levels in either country. However, Turkish students reported higher netlessphobia (mean = 37.43) than Iranian students, while Iranians showed slightly higher anxiety (mean = 17.32). Both phobias strongly predicted anxiety in both samples ($R^2 > 0.3$, $f^2 > 0.4$). Mediation analysis revealed that 77% of the effect of smartphone overuse on anxiety was indirectly explained by netlessphobia, suggesting anxiety stems more from fear of losing internet access than from phone absence. ***Conclusions:*** This study's findings underscore the need for targeted mental health interventions in nursing education, such as digital wellness programmes, mindfulness training and awareness campaigns. Culturally sensitive strategies to promote healthy tech habits could mitigate anxiety related to these phobias in an increasingly connected world.

Keywords: Phobias; Students; Mediation Analysis; Anxiety; Nursing; Cross-Cultrual Comparison; Iran; Turkiye

1. Introduction

In the digital age, smartphones are essential for communication, information access and social interaction, especially among youth. While offering educational and connectivity benefits, their overuse has been linked to mental health concerns such as depression, anxiety and cognitive fatigue, driven by constant connectivity and fear of missing out (FOMO).[1–6] Two emerging conditions—nomophobia (fear of being without a mobile phone) and netlessphobia (fear of losing internet access)—have been associated with stress, sleep disturbances, attention deficits and academic decline, particularly among students.[7–10] Though related, these phobias differ: nomophobia reflects device dependency, while netlessphobia involves distress from disconnection [Fig. 1].

For clinical students, including nursing students, reliance on digital tools for research, professional growth and communication can amplify the psychological impact of these phobias. The pressures of clinical training, societal expectations and constant availability exacerbate anxiety and depression.[11–14] Poor emotion regulation, cyberbullying, perfectionism and low self-worth further worsen these effects.[15–17] Addressing these issues requires culturally tailored strategies to reduce digital dependency and build resilience to digital stressors.

This study examined the cultural and technological contexts of Iran and Türkiye, two countries with shared collectivist traditions but differing education policies, digital infrastructures and globalisation levels. Despite common values such as family cohesion and academic achievement, national policy differences significantly shape students' relationships with digital devices.[18–20]

Türkiye has advanced rapidly in terms of digital connectivity, with 5G networks, widespread Wi-Fi and higher internet speeds. Conversely, Iran experiences frequent disruptions, state-imposed restrictions on global platforms (e.g., Facebook, YouTube) and limited access during politically sensitive periods. These disparities likely heighten Turkish students' sensitivity to internet disconnection, contributing to elevated Netlessphobia compared to their Iranian counterparts.[20–22]

Turkish nursing programmes emphasise early clinical exposure and digital integration, requiring consistent use of e-learning platforms and telehealth tools. In contrast, Iranian curricula rely more on traditional methods, with limited digital adoption due to restricted access and intermittent connectivity. These differences may explain variations in digital dependency and anxiety responses among students.[23–25]

Smartphone ownership and unrestricted digital access are more normalised in Türkiye, whereas Iran's norms are shaped by religious and governmental regulations. Gender-based restrictions and parental oversight of internet use are more prevalent in Iran, potentially moderating the development of both NoMoPhobia and Netlessphobia.[20–25]

This study aimed to bridge the gaps in understanding how socio-cultural and technological factors shape digital phobias. Using validated instruments—the Nomophobia Scale, Netlessphobia Scale, and Beck Anxiety Inventory (BAI)—ensures reliable assessment of psychological impacts.[21–25] Building on prior studies, such as Kanbay *et al.*'s work, it highlights how regional norms and adoption patterns influence digital anxiety.[7,21]

Grounded in cognitive load theory and self-determination theory (SDT), this research situated digital phobias within broader constructs of autonomy, competence and emotional regulation. It contributes to the discourse on digital mental health, emphasising context-sensitive interventions tailored to specific educational and cultural settings. By comparing how nomophobia and netlessphobia manifest in Iran and Türkiye, this study aimed to provide actionable insights for educators, policymakers and mental health professionals. It underscores the need to promote healthier digital behaviors among future healthcare professionals, addressing the interplay of

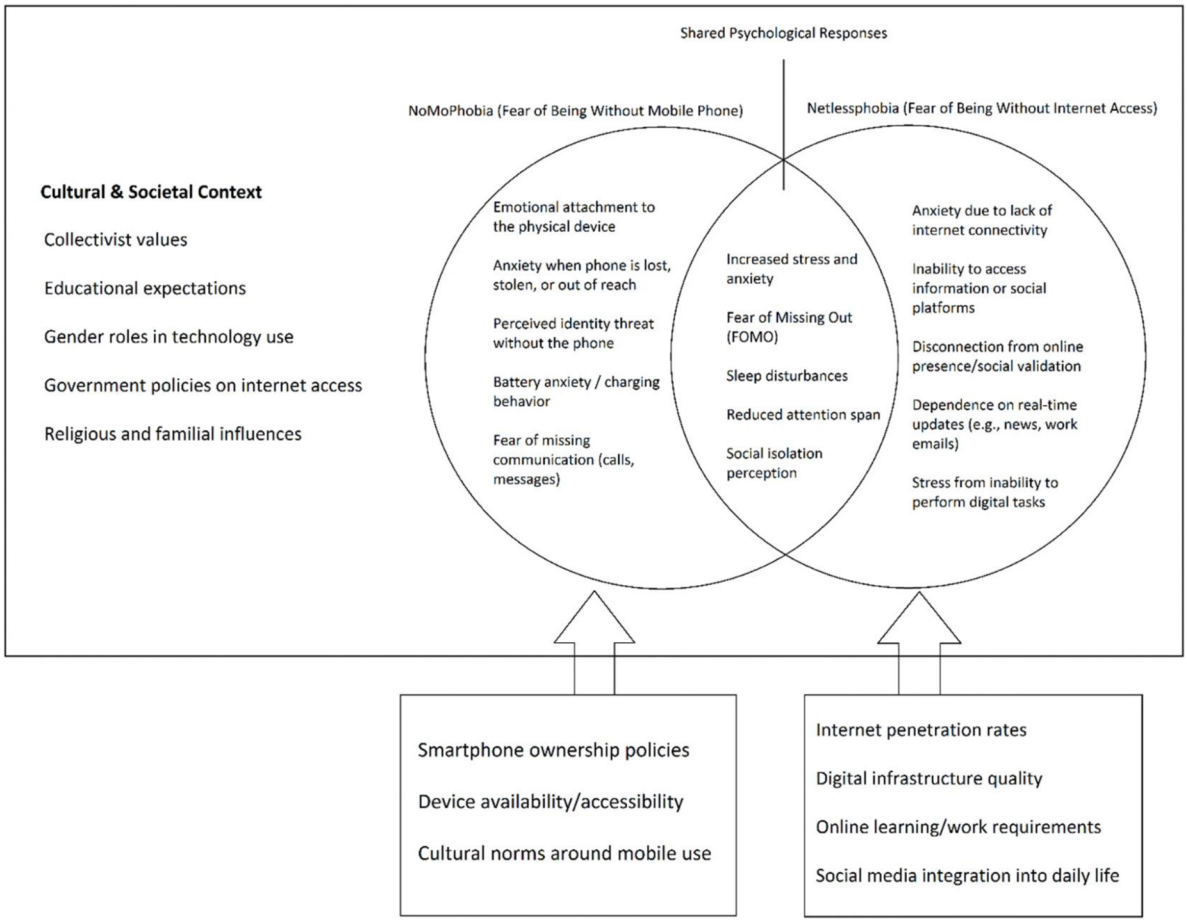

Fig. 1. Conceptual framework illustrating the distinction and overlap between nomophobia and netlessphobia with emphasis on psychological responses and cultural-societal influences in the context of iran and Türkiye.

technology dependence, psychological vulnerability and cultural context.

2. Methods

This cross-sectional study used a mediation analysis framework to investigate the relationships between nomophobia, netlessphobia and anxiety among nursing students in Iran and Türkiye. The data were collected from June to July 2024. Participants were required to be currently enrolled as nursing students, own and regularly use a smartphone, be fluent in Persian (Iran) or Turkish (Türkiye), have no known communication disorders or severe mental health conditions that could affect comprehension.

Prior to data collection, a power analysis was conducted using NCSS-PASS software, Version 15, to determine the minimum required sample size. Considering a moderate effect size ($f^2 = 0.15$) for regression models, a statistical power of 90% and a significance level of $\alpha = 0.05$, the analysis indicated that a minimum sample size of 600 was necessary. To ensure diversity in educational background, participants were selected using stratified random sampling. For stratification, the sample was proportionally allocated based on key demographic variables such as gender, academic year (first through fourth year) and institution type (public versus private universities) to ensure representativeness across the two countries. This approach enhanced the generalisability of the findings while maintaining statistical rigor.

Data were collected using both electronic and paper-based formats. All questionnaires were identical in content and structure across formats to ensure consistency. Electronic forms were distributed via email, social media platforms and university learning management systems. Paper forms were administered in person by trained personnel in libraries, classrooms and designated student centres. Those who withdrew before completing the questionnaire were replaced by the next eligible individual from the sampling list to maintain sample integrity.

A total of 4 instruments were used in this study. First, the demographic characteristics questionnaire collected data on age, gender, marital status, academic year and device usage habits. Second, the nomophobia Scale (short form) is a validated tool assessing fear of being without a mobile phone.[8] It uses a 5-point Likert scale, where a score of 1 means "completely disagree," 2 means "disagree," 3 means "neutral," 4 means "agree," and 5 means "strongly agree." There are no reverse scored items included. The minimum and maximum scores possible are 8 and 40, respectively, with higher scores reflecting a greater level of NoMoPhobia. The scale's validity and reliability were tested in the general population, confirming its appropriateness for individuals aged 15 and older. It is advisable to verify the scale's validity and reliability before using it with younger individuals.

Third, the Netlessphobia Scale, developed by Kanbay *et al.*, measures anxiety associated with internet disconnection.[7] It consists of one dimension and 12 items, accounting for 60.7% of the total variance related to Netlessphobia. The Cronbach's α reliability coefficient for the scale was determined to be 0.93, indicating a high level of reliability. The scale's lowest and highest possible scores are 12 and 60, respectively, and it does not include any reverse scoring items. Higher scores reflect greater levels of Netlessphobia.

Finally, the BAI is a widely used clinical assessment tool for general anxiety symptoms.[9] All scales were administered in their validated language versions. The Turkish versions of the NoMoPhobia and Netlessphobia scales were used as originally developed, while the Persian versions were translated and culturally adapted following International Society for Pharmacoeconomics and Outcomes Research (ISPOR) guidelines. The NoMoPhobia Scale demonstrated strong psychometric properties in both Iranian and Turkish samples in this study. For Iranian students, the scale showed high internal consistency (Cronbach's $\alpha = 0.86$) and satisfactory construct validity, aligning with previous studies. Similarly, Turkish students exhibited robust reliability (Cronbach's $\alpha = 0.89$), with factor analysis confirming the unidimensional structure of the scale. These findings indicate that the scale effectively captures NoMoPhobia across cultural contexts.

The Netlessphobia Scale also displayed excellent reliability and validity in both groups. Among Iranian students, the scale achieved a Cronbach's α of 0.88, with confirmatory factor analysis supporting its structural integrity. For Turkish students, the scale demonstrated even higher reliability (Cronbach's $\alpha = 0.91$), consistent with its original validation. These results highlight the scale's cross-cultural applicability in assessing anxiety related to internet disconnection. In addition, McDonald's *Omega* was calculated for all scales to further confirm their reliability. The *Omega* coefficients for both the NoMoPhobia and Netlessphobia scales were highly satisfactory ($\omega > 0.85$ for both Iranian and Turkish samples), indicating excellent internal consistency and reinforcing the suitability of these tools for this cross-cultural study.

ISPOR guidelines for translation and cultural adaptation process included the following steps: forward translation into Persian by two independent bilingual translators, reconciliation of translations into a single version, backward translation into English by two different translators unaware of the original scale, review by a committee of experts to resolve discrepancies, pilot testing with a small group of nursing students to assess clarity and cultural relevance and final approval of the Persian version for administration.

Data were analysed using Statistical Package for Social Sciences (SPSS) software, Version 28 (IBM Corp., Armonk, New York, USA) and JAMOVI Version 2.6.2. To examine the relationships among technology use, phobias and anxiety, mediation analyses were conducted using the PROCESS macro in SPSS (IBM Corp.) and confirmed results using JAMOVI. Two separate mediation models were tested: model 1 examined Netlessphobia as a mediator between '24/7 mobile phone use' and 'anxiety'; and model 2 examined NoMoPhobia as a mediator between '24/7 mobile phone use' and 'anxiety'.

To further investigate how constant smartphone use relates to anxiety, the authors tested whether this relationship was mediated by NoMoPhobia or Netlessphobia. Bootstrapping with 5,000 resamples was used to estimate indirect effects, and the significance of the indirect path was determined by examining whether the 95% confidence interval excluded 0. The Sobel test and Aroian test were also used to confirm the mediating role of each phobia in the relationship between digital behavior and anxiety.

For clarity, partial mediation means that part of the effect runs directly from the independent variable (e.g., constant phone use) to the outcome (e.g., anxiety), while another part is explained through a third variable (e.g., Netlessphobia). Full mediation, on the other hand, means that the entire effect is explained only through the mediator. Moderation refers to when a third variable changes the strength or direction of the relationship but does not explain the mechanism itself.

Descriptive statistics were used to summarise sociodemographic characteristics and scale scores. Group comparisons between Iranian and Turkish

Table 1. Comparison of mean scores for nomophobia, netlessphobia and anxiety between Iranian and Turkish nursing students (N = 697).

Variable	Mean ± SD		Student's t-test	df	*P* value	MD	SE difference	Effect size: *Cohen's d*	95% CI
	Iran	Türkiye							
Using mobile phone 24 hours a day	5.31 ± 2.96	4.41 ± 2.584	4.491	695	<0.001	0.900	0.2004	0.3417	0.190 to 0.4929
Checking mobile phone 24 hours a day	4.99 ± 5.65	5.27 ± 2.663	–0.851*	695	0.395	–0.277	0.3260	–0.0647	–0.214 to 0.0846
Using Internet 24 hours a day	4.81 ± 3.11	0.38 ± 1.013	26.192*	695	<0.001	4.432	0.1692	1.9929	1.777 to 2.2075
Using a PC 24 hours a day	0.70 ± 1.36	0.25 ± 0.821	5.354	695	<0.001	0.448	0.0837	0.4074	0.255 to 0.5595
Using gaming accessories 24 hours a day	0.61 ± 1.11	1.36 ± 1.542	7.197*	695	<0.001	–0.746	0.1036	–0.5476	–0.702 to –0.3921
Netlessphobia	34.21 ± 9.3	37.43 ± 10.304	4.293*	695	<0.001	–3.222	0.7504	–0.3267	–0.478 to –0.1751
Nomophobia	22.82 ± 6.86	27.12 ± 7.231	8.007	695	<0.001	–4.307	0.5379	–0.6092	–0.765 to –0.4523
BAI	17.32 ± 12.48	14.22 ± 11.381	3.428	695	<0.001	3.102	0.9048	0.2608	0.110 to 0.4112

**Levene's test is significant at P < 0.05 suggesting a violation of the assumption of equal variances.*

SD = standard deviation; df = degrees of freedom; MD = mean difference; SE = standard error; CI = confidence interval; BAI = Beck Anxiety Index.

students were conducted using independent samples t-tests and mediation analysis. All analyses controlled for key sociodemographic variables (age, academic year, marital status). Multicollinearity was assessed using variance inflation factor (VIF), with all values below 3, indicating acceptable independence among predictors. Statistical significance was set at $P < 0.05$ (two-tailed).

3. Results

A total of 697 nursing students from Türkiye (n = 316) and Iran (n = 381) participated in the study (response rate = 97.6%) aged between 18 and 34 years (mean age ± standard deviation [SD] = 21.94 ± 2.52 years, interquartile range [IQR] = 3). Most participants were single (96.4%) and all were actively enrolled in undergraduate nursing programmes. Out of an initial pool of 714 respondents, 17 participants were excluded due to incomplete responses (n = 10), voluntary withdrawal before completion (n = 4) or failure to meet inclusion criteria (e.g., lack of smartphone access, communication or mental health impairments, n = 3).

Using the BAI cutoff score (>24) for clinical anxiety, 10.9% of Turkish students (n = 76) and 9.3% of Iranian students (n = 65) met the criteria. The psychological constructs measured showed the following means and standard deviations: Netlessphobia (mean ± SD = 35.97 ± 9.98, IQR = 14), NoMoPhobia (mean ± SD = 25.71 ± 7.38, IQR = 11) and BAI anxiety scores (mean ± SD = 15.62 ± 11.98, IQR = 14). Between-country comparisons revealed no significant difference in 'checking mobile phone 24 hours a day' ($P > 0.05$). However, statistically significant differences were observed in other variables, including 'using mobile phone 24 hours a day', 'using internet 24 hours a day', 'using PC 24 hours a day', 'using gaming accessories 24 hours a day' as well as total Netlessphobia, NoMoPhobia and BAI scores ($P < 0.05$ each) [Table 1].

Gender significantly influenced patterns of technology use. Male students reported higher engagement with the internet, PCs and gaming accessories around the clock ($P < 0.05$). However, no significant difference was observed between genders regarding the frequency of checking behaviours, such as repeatedly checking phones. These findings suggest that while the frequency of device interaction may be similar across genders, the intensity, duration and type of digital engagement differs meaningfully [Table 2].

In terms of scale reliability, all instruments demonstrated strong internal consistency. For netlessphobia, Cronbach's α was 0.918 and McDonald's ω was 0.921; for NoMoPhobia, Cronbach's α was 0.941 and McDonald's ω was 0.912; and for the BAI, Cronbach's α was 0.933 and McDonald's ω was 0.934. All values exceeded the recommended threshold of ≥0.70, confirming the reliability and validity of the scales used in subsequent analyses.

Multiple regression models were developed using the stepwise method, after confirming assumptions of normality, linearity and absence of multicollinearity (VIF < 3). All models showed good fit indices, with adjusted $R^2 \geq 0.325$ and effect sizes ($F^2 \geq 0.51$),

Table 2. Gender-based differences in mean scores for nomophobia, netlessphobia and anxiety among nursing students (n = 697).

Variable	Mean ± SD		Student's t-test	df	*P* value	MD	SE difference	Effect size: *Cohen's d*	95% CI
	Male	Female							
Using mobile phone 24 hours a day	4.95 ± 2.55	4.71 ± 2.76	1.187	695	0.236	0.241	0.2031	0.0903	–0.0590 to 0.240
Checking mobile phone 24 hours a day	5.08 ± 4.11	5.19 ± 4.42	–0.338	695	0.736	–0.110	0.3261	–0.0257	–0.1748 to 0.123
Using Internet 24 hours a day	3.24 ± 3.15	1.68 ± 2.93	6.729*	695	<0.001	1.555	0.2311	0.5118	0.3571 to 0.666
Using a PC 24 hours a day	0.62 ± 1.31	0.33 ± 0.91	3.412*	695	<0.001	0.289	0.0846	0.2596	0.1089 to 0.410
Using gaming accessories 24 hours a day	0.71 ± 1.14	1.29 ± 1.55	–5.553*	695	<0.001	–0.583	0.1051	–0.4224	–0.5747 to –0.269
Netlessphobia	35.74 ± 9.88	36.16 ± 10.07	–0.559	695	0.576	–0.425	0.7599	–0.0425	–0.1916 to 0.107
Nomophobia	25.1 ± 7.48	25.32 ± 7.3	–0.568	695	0.571	–0.319	0.5619	–0.0432	–0.1923 to 0.106
BAI	15.5 ± 11.9	15.71 ± 11.98	–0.196	695	0.845	–0.178	0.9121	–0.0149	–0.1640 to 0.134

**Levene's test is significant at P < 0.05 suggesting a violation of the assumption of equal variances.*

SD = standard deviation; df = degrees of freedom; MD = mean difference; CI = confidence interval; BAI = Beck Anxiety Index.

indicating substantial explained variance. Regression analysis demonstrated that Netlessphobia was the strongest predictor of anxiety in both samples. For Turkish students, Netlessphobia alone predicted 39.2% of the variance in anxiety ($\beta = 0.392$; $P < 0.05$), while for Iranian students, it accounted for 19.7% of the anxiety variance ($\beta = 0.197$; $P < 0.05$). These findings support the hypothesis that fear of internet disconnection (Netlessphobia) plays a more central role in anxiety than fear of being without a physical device (nomophobia), particularly in environments with robust digital infrastructure, such as Türkiye. Two separate models were developed for Iranian and Turkish students to predict compulsive phone-checking behavior. In Turkish students, netlessphobia predicted 33.1% of the variance ($\beta = 0.331$; $P < 0.05$), while in Iranian students, it predicted 20.1% of the variance ($\beta = 0.201$; $P < 0.05$). Despite intermittent internet access in Iran, the emotional need to remain connected continues to significantly influence behavioral habits [Table 3].

The variable 'using gaming accessories 24 hours a day' was included in the model due to its growing relevance in understanding digital dependency behaviors. Gaming devices often serve as alternative platforms for social interaction, entertainment and escapism; these functions are closely linked to anxiety and compulsive use patterns among young adults. Its inclusion allowed this study to explore whether non-traditional tech tools contribute uniquely to phobic and anxious responses in this population.

In Model 1, netlessphobia served as the mediator. Path c (direct effect) represented the relationship between constant smartphone use and anxiety, which was significant. Paths a × b (indirect effect) demonstrated that constant smartphone use led to netlessphobia, which in turn increased anxiety, and this indirect effect was also significant. The indirect effect accounted for 77% of the total effect, with an indirect t-test = 0.238, 95% CI: 0.064–0.412, Z = 2.689; $P = 0.007$ [Table 4]. Since both direct and indirect effects were significant, this represents partial mediation, suggesting that the anxiety associated with constant phone use is largely driven by the underlying fear of losing internet access.

In Model 2, nomophobia acted as the mediator. Path c, representing the direct relationship between constant smartphone use and anxiety, was significant. Paths a × b, indicating the indirect pathway from constant smartphone use to nomophobia and then to anxiety, were also significant. The indirect effect accounted for 54.2% of the total effect, with an indirect t-test = 0.154, 95% CI: 0.019–0.295, Z = 2.139; $P = 0.032$ [Table 5]. This also indicates partial mediation.

In this study, both pathways showed partial mediation, meaning that while the mediators (netlessphobia/nomophobia) explained part of the effect, a direct link between constant smartphone use and anxiety remained. Together, these findings support the hypothesis that both nomophobia and netlessphobia mediate the impact of persistent smartphone use on anxiety, though netlessphobia had a stronger influence, particularly among Turkish students.

These results resonate with cognitive load theory, which posits that constant connectivity overwhelms working memory and reduces emotional regulation capacity. They also align with SDT, suggesting that dependency on external validation and information leads to reduced autonomy and increased anxiety. Furthermore, the stronger influence of Netlessphobia over nomophobia supports the idea that fear of being offline versus. Simply not having the device reflects a

Table 3. Multiple regression analysis predicting nomophobia and netlessphobia scores based on demographic and psychological variables.

Predictive variable	Turkish students (n = 316)			Iranian students (n = 381)	
1-Baseline measures\\	Model 1‡	Model 2§	Model 3¶	Model 1¶	
Netlessphobia	0.371†	0.365*	0.392*	0.197†	
Nomophobia	0.150†	0.180*			
Using mobile phone 24 hours a day	0.120†				
Observations	5368.46	5232.021	5116.48	4918.75	
Adjusted R^2	0.392	0.431	0.446	0.197	
Effect size measure of F^2 for models	0.644	0.757	0.805	0.245	
2-Baseline measures††	Model 1‡	Model 2¶		Model 1**	Model 2¶
Netlessphobia	0.306*	0.331*		0.179†	0.201†
Nomophobia	0.161*				
Using mobile phone 24 hours a day				0.133*	
Observations	4344.46	4832.21		4917.55	4777.51
Adjusted R^2	0.331	0.366		0.201	0.241
Effect size measure of F^2 for model	0.494	0.577		0.251	0.317

*$P < 0.05$. †$P < 0.01$. Method: Stepwise (criterion: probability of F-to-remove ≥ .100).

‡*Predictors: (Constant), Netlessphobia, Nomophobia, Using mobile phone 24 hours a day.*

§*Predictors: (Constant), Netlessphobia, Nomophobia.*

¶*Predictors: (Constant), Netlessphobia.*

Dependent variable: BAI.

***Predictors: (Constant), Netlessphobia, Using mobile phone 24 hours a day.*

††*Dependent variable: checking mobile phone 24 hours a day.*

deeper existential concern tied to identity and belonging in digitally-mediated societies. This distinction is especially relevant in collectivist cultures such as Iran and Türkiye, where social cohesion and academic performance are closely intertwined with digital presence.

4. Discussion

One of the most notable findings of this study was the significant difference in levels of nomophobia and netlessphobia between nursing students in Türkiye and Iran. Turkish students reported higher scores on both scales, particularly in netlessphobia. This disparity can be attributed to several structural and environmental factors. Türkiye's more advanced digital infrastructure—marked by widespread 4G/5G access and fewer restrictions on global platforms—supports a culture of near-constant connectivity.[26–28] In contrast, Iranian students face frequent internet disruptions, especially during politically sensitive periods, which may have fostered a degree of adaptive resilience or habituation to intermittent access.[27–29] These infrastructural differences likely shape emotional responses to disconnection: Turkish students, accustomed to stable internet, may experience greater distress when disconnected, while Iranian students may develop coping strategies that reduce their phobic reactions over time.[23–29] Moreover, differences in educational systems play a role. Turkish clinical training emphasises early and intensive exposure to real-world healthcare settings, increasing reliance on digital tools for communication, information retrieval and collaboration. In comparison, Iranian nursing curricula place relatively more emphasis on traditional learning methods, possibly limiting opportunities for deep digital integration and reducing the perceived necessity of constant connectivity.[25–27]

Contrary to prior research suggesting gender disparities in digital dependency—such as higher smartphone anxiety among males or greater emotional attachment to devices among females—this study found no significant gender differences in either country. Several factors may explain this deviation. First, the highly structured nature of nursing education —with its demanding workload, strict schedules and shared expectations for digital engagement—may reduce behavioural variation between genders. Both male and female students are exposed to similar academic pressures and institutional norms regarding device use, potentially equalising patterns of digital behaviour. Second, the broader context of digital equity among university populations may be shifting. As smartphones and internet access become normalised across genders, differences in usage intensity and emotional attachment may diminish. This trend is particularly evident in collectivist societies such as Iran and Türkiye, where social conformity can standardise technology practices within peer and professional groups, including nursing students. Finally, cultural normalisation of mobile phone use in everyday life may also contribute to this convergence. In both countries, mobile phones serve not only personal

Table 4. Mediation analysis results showing the role of netlessphobia in explaining anxiety levels among nursing students (N = 697).

Mediation estimates											
Effect			Label	Estimate	SE	95% CI	Z	*P* value	% mediation	Sobel test	Aroian test
Indirect			a × b	0.2384	0.0887	0.0646 to 0.412	2.689	0.007*	77	9.642	9.631
Direct			c	0.0711	0.3129	–0.5421 to 0.684	0.227	0.001*	23	–	–
Total			c + a × b	0.3096	0.3216	–0.3207 to 0.940	0.963	0.001*	100	–	–
Path estimates											
Using mobile phone 24 hours a day	→	Netlessphobia	a	0.7774	0.0442	0.255 to 1.300	2.917	0.004†			
Netlessphobia	→	BAI	b	0.3067	0.0266	0.220 to 0.393	6.939	0.001†			
Using mobile phone 24 hours a day	→	BAI	c	0.0711	0.3129	–0.142 to 0.684	0.227	0.021*			

**P < 0.05. †P < 0.01. Sobel and Aroian tests as mediation statistic coefficients.*

SE = standard error; CI = confidence interval; BAI = Beck Anxiety Index.

Table 5. Mediation analysis results showing the role of nomophobia in explaining anxiety levels among nursing students (N = 697).

Mediation estimates											
Effect			Label	Estimate	SE	95% CI	Z	*P* value	% mediation	Sobel test	Aroian test
Indirect			a × b	0.154	0.0720	0.0129 to 0.295	2.139	0.032*	54.2	5.433	5.428
Direct			c	0.155	0.3158	-0.1635 to 0.774	0.492	0.001†	45.8	-	-
Total			c + a × b	0.310	0.3216	-0.3207 to 0.940	0.963	0.001†	100.0	-	-
Path estimates											
Using mobile phone 24 hours a day	→	Nomophobia	a	0.457	0.0197	0.0704 to 0.845	2.316	0.021*			
Nomophobia	→	BAI	b	0.337	0.0603	0.2186 to 0.455	5.583	0.001†			
Using mobile phone 24 hours a day	→	BAI	c	0.155	0.3158	-0.4635 to 0.774	0.492	0.023*			

**P < 0.05. †P < 0.01. Sobel and Aroian tests as mediation statistic coefficients.*

SE = standard error; CI = confidence interval; BAI = Beck Anxiety Index.

but also critical academic functions, blurring the distinctions that might otherwise emerge along gender lines.[25–27]

This study's mediation analysis revealed that both nomophobia and netlessphobia partially mediate the relationship between persistent smartphone use and anxiety, aligning with theoretical frameworks such as SDT and cognitive load theory. Notably, netlessphobia showed a stronger mediating effect, particularly among Turkish students. This suggests that fear of being offline —rather than simply being without a device—is a more potent driver of anxiety in digitally connected environments. Constant access fosters dependence on real-time updates, social validation and instant gratification, eroding autonomy and increasing vulnerability to stress when these connections are disrupted. This dynamic supports SDT's assertion that well-being is undermined when individuals rely heavily on external validation. Additionally, cognitive load theory explains how persistent multitasking and information overload impair executive functioning, further contributing to anxiety symptoms. These findings highlight the importance of addressing psychological mechanisms beyond screen time alone, emphasising the need to help students manage the emotional consequences of digital disconnection.[28]

Both Iran and Türkiye share collectivist cultural values, where identity is closely tied to group belonging and social harmony. In modern contexts, this often translates into a strong motivation to remain digitally connected, as online presence facilitates social cohesion, peer interaction and academic collaboration.[29] In Türkiye, where consistent internet access enables round-the-clock participation in digital spaces, the FOMO is intensified. The high value placed on real-time communication and social media visibility contributes to heightened sensitivity to disconnection, fueling netlessphobia.[29] Conversely, in Iran, despite restricted access, students may have developed resilience strategies to cope with periodic digital disconnections. These include increased reliance on offline communication networks, peer-

based resource sharing and face-to-face interactions, which may buffer against the development of severe digital phobias. Additionally, strong family and community support systems common in Iranian society may provide alternative sources of reassurance and emotional stability, reducing dependence on digital validation. Thus, while technological barriers exist in Iran, they may paradoxically foster adaptive behaviors that protect mental health in ways not seen in more digitally saturated environments.[29]

While this study provides valuable insights into cross-cultural differences in digital dependency and anxiety, several limitations should be acknowledged. The sample was limited to nursing students, who were primarily young, single and fluent in Persian or Turkish, meaning the findings may not generalise to other academic disciplines or older populations. Additionally, the cross-sectional design prevents the inference of causality, highlighting the need for longitudinal studies to explore the developmental trajectories of these phobias. Although stratified random sampling was employed, participation was voluntary, which may have introduced selection bias favouring more digitally engaged individuals. Furthermore, the study lacked detailed information on socioeconomic factors such as participants' financial background, region, ethnicity or religious beliefs, all of which could influence digital habits and psychological outcomes. Another limitation is the reliance on self-reported measures rather than objective tracking of device usage, potentially affecting the accuracy of the data. Finally, there is no detailed information on other potentially influential factors such as age, region, ethnic background, social status, financial background or religion from the two study populations. Despite these limitations, the robust methodology, large sample size and culturally informed analysis enhance the validity and relevance of the study's findings.

5. Conclusion

This study underscores the complex interplay between nomophobia, netlessphobia and anxiety among nursing students in Iran and Türkiye, emphasising the importance of cultural, educational and technological contexts in shaping digital dependency. While both phobias were significantly linked to anxiety, netlessphobia emerged as the stronger predictor, particularly in environments with reliable internet access. To address these emerging mental health concerns, institutions must implement culturally sensitive interventions. These could include integrating digital wellness and mindfulness training into nursing curricula, promoting scheduled tech breaks and analog learning methods as well as establishing peer support networks and mental health counseling services tailored to digital stress. Additionally, creating tech-free zones and launching awareness campaigns about digital phobias and revising policies that reinforce expectations of constant availability, are crucial steps. Ultimately, fostering healthier relationships with technology requires a multidimensional approach—one that recognises the psychological impact of digital dependency and promotes resilience in the face of ongoing technological change. This research contributes to an evolving discourse on digital mental health, offering actionable insights for educators, policymakers and mental health professionals seeking to support future healthcare workers in navigating the challenges of an increasingly connected world.

Authors' Contribution

Mohsen S. Ardakani: Conceptualization, Investigation, Data Curation, Writing – Review & Editing. **Abdolrahim Asadollahi:** Formal Analysis, Methodology, Writing – Review & Editing, Supervision, Project Administration. **Maryam Bakhtiar:** Writing – Original Draft, Writing – Review & Editing. **Sevil Ç. Özbay:** Writing – Review & Editing, Supervision, Project Administration. **Yalçın Kanbay:** Validation, Writing – Review & Editing.

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Ethics Statement

Ethical approval for this study was obtained from the Centre of Studies and Research of the Ministry of Health (IR.SUMS.DENTAL.REC.1401.133). All participants completed the study anonymously and voluntarily. Informed consent was obtained prior to participation.

Conflict of Interest

The authors declare no conflicts of interest.

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Data Availability

Data is available upon reasonable request from the corresponding author.

Generative AI Statement

The authors declare that they have not used any type of generative artificial intelligence for doing the study, nor for the creation of images, graphics, tables, or their corresponding captions. During the preparation of the manuscript, the authors utilised artificial intelligence solely for grammatical corrections and language editing to enhance readability (Qwen 2.5-Max and Grammarly). The text was reviewed by the authors and take full responsibility for its accuracy.

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